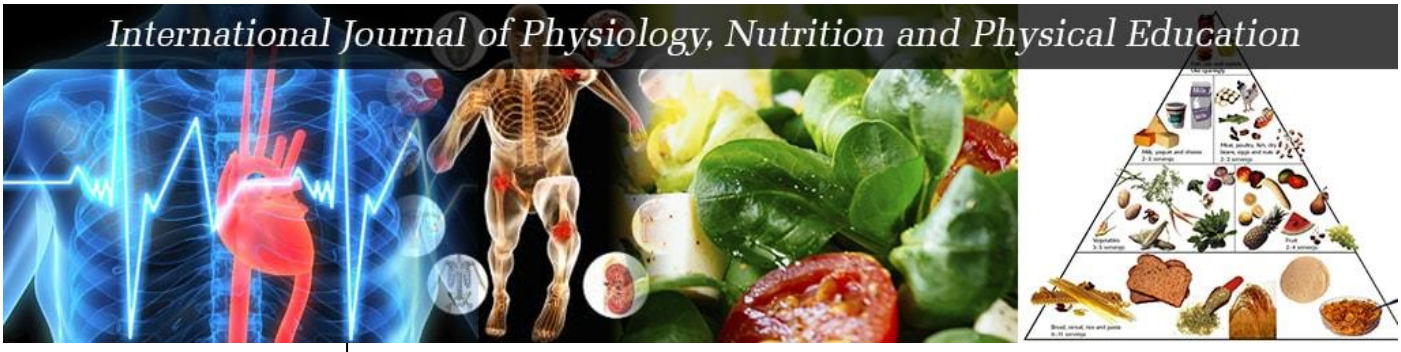

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Effects of gymnastic activities on selected physical fitness variables of school girls

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Abstract
The term 'Gymnastics' derived from Greek word meaning 'to exercise naked'. Gymnastics develop various component of health related physical fitness such as strength, flexibility, agility, co-ordination, balance and grace. Flexibility is a part and parcel of physical fitness and physical fitness stands on body composition. Actually Gymnastics make a man complete. One hundred (N=100) school girls of Howrah District, West Bengal were selected at randomly as subjects for the present study. The age limit of the subjects was 10-12 years. All the subjects were divided in to two equal groups such as Gr. G and Gr. C. Gr. G was experimental group who were practiced gymnastics activities and Gr. C was control group. Initially Flexibility measures in various joints in the body, Body Composition (Such as BMI, % of body fat and LBM) measuring equipments were employed to all the subjects of both the groups and thereafter specific gymnastic activities were given to Gr. G for three days in a week and continued one six and finally the subjects were retested on criterion measures. The data were analyzed by t-ratio to find out the effects of the treatment. The result of the study showed that the all flexibility measures and body mass index, % of body fat and LBM were improved significantly among gymnastics group but lean body mass was not improved significantly after six months yogic treatment.

Keywords: Attitude, body composition, flexibility, self-concept

Introduction
The term 'Gymnastics' derived from Greek word meaning 'to exercise naked'. Gymnastics develop various component of physical fitness such as strength, flexibility, agility, co-ordination, balance and grace. Flexibility is a part and parcel of physical fitness and physical fitness stands on body composition. Flexibility may be defined as a joint's ability to move freely or normal range of motion and body composition refers to the lean tissue and fat tissue in the body. Actually gymnastics make a man complete- physically as well as mentally. Attitude and self-concept are complex component of mind and they develop through gymnastic activities. Gymnastic activities are not only the reflection of body and mind but also a contribution of oneself and the eternal power. Attitude and self-concept are complex component of behaviour. Attitude may be defined as a complex mental state involving belief, feelings and values and disposition to act in certain ways. Self-concept may be explained as a person's perception about him or himself. Bondopadhyay, K (2012) [3] studied on related variables and stated that different flexibilities of body parts and body composition were improved significantly due to one year gymnastic activities among school boys. Bala and Thakur (2013) studied on self-concept and attitude among school boys and results revealed that gymnastics improved above mental components due to one year treatment among young school boys.

Methodology
Hundred (N=100) school girls of District Howrah, West Bengal State were selected at randomly as subjects for the present study. The age limit of the subjects was 10-12 years. All the subjects were divided into two equal groups such as Gr. G and Gr. C. Gr. G was experimental group and Gr. C served as control group.
Initially all the flexibility measures of different parts of the body and body composition such as body mass index (BMI), % of body fat (%BF) and lean body mass (LBM) and school attitude and self-concept were employed to all the subjects of both groups and thereafter specific gymnastic activities were given to Gr.

G for six months and finally the subjects were retested on criterion measures. The data were analyzed by t-ratio to find out the effects of the treatment.

Treatment consists of following gymnastic activities

Rolling- forward and backward, cart wheel, front turn and back turn, split sitting, handstand, handspring, round-off, back flip, front and back salt.

Prior to gymnastic activities all the subjects of Gr. G performed warm up exercise for 15 minutes. Gymnastics activities were assigned according to degree of difficulty in four phases. Duration and repetition and degree of difficulty were increased gradually at four phases during the treatment season. The concept of the treatment programme was framed on the basis of Rhythmic and Educational Gymnastics. Http://www.mnps.org/page:11294.aspx

Result and Discussion

All the flexibility measures and body composition were analyzed by paired t-test and level of significance was set up at .05 level of confidence.

Table 1: Group means increase in flexibility measures among Gr. G and Gr. C after six months

Variables	Test	Gr. G (N=50)			Gr. C (N=50)		
		Mean	SD	t	Mean	SD	t
Wrist flexion (Degree)	Pre-test	89.4	5.82	18.93	89.66	6.34	0.10
	Post-test	93.82	5.63		89.24	6.10	
Wrist extension (Degree)	Pre-test	53.94	7.71	15.5	52.16	7.17	0.03
	Post-test	61.16	6.74		51.6	6.59	
Elbow flexion (Degree)	Pre-test	145.60	4.25	21.34	145.34	4.39	0.84
	Post-test	150.36	4.42		144.38	4.58	
Knee flexion (Degree)	Pre-test	138.06	5.88	29.4	137.52	6.43	-0.24
	Post-test	147.72	4.34		136.78	7.01	
Ankle dorsi flexion (Degree)	Pre-test	25.14	3.02	23.95	25.50	3.14	0.92
	Post-test	29.68	3.20		24.58	2.99	
Ankle Planter flexion (Degree)	Pre-test	41.08	6.86	33.0	41.24	6.61	0.12
	Post-test	50.20	6.68		39.82	6.03	
Spine flexion (Inch)	Pre-test	13.25	1.95	29.45	13.24	1.93	-0.21
	Post-test	8.39	1.13		14.16	2.04	
Trunk flexion (Inch)	Pre-test	1.92	2.08	34.4	1.62	1.29	1.12
	Post-test	12.16	3.03		0.92	1.10	

Significant at .05 level of confidence

Table-1 represents the mean values of pre test and post test for wrist flexion, wrist extension, elbow flexion, knee flexion, ankle dorsi flexion, ankle planter flexion, spine flexion and trunk flexion of Gr. G and Gr. C. The t-values of Gr. G for all flexibility measures were 18.93, 15.5, 21.34, 29.4, 23.95, 33.0, 29.45 and 34.4 respectively. To be significant at .05 level of confidence the t-value should be greater than 2.01. In this case, so all the t-values of Gr. G were significant at .05 level of confidence for improving all flexibility measures. The t- values of Gr. C for all flexibilities measures were 0.10, 0.03, 0.84, -0.24, 0.92, 0.12, -0.21 and 1.12 respectively. The t values of Gr. C in relation to improvement of all flexibility measures were not significant at .05 level of confidence.

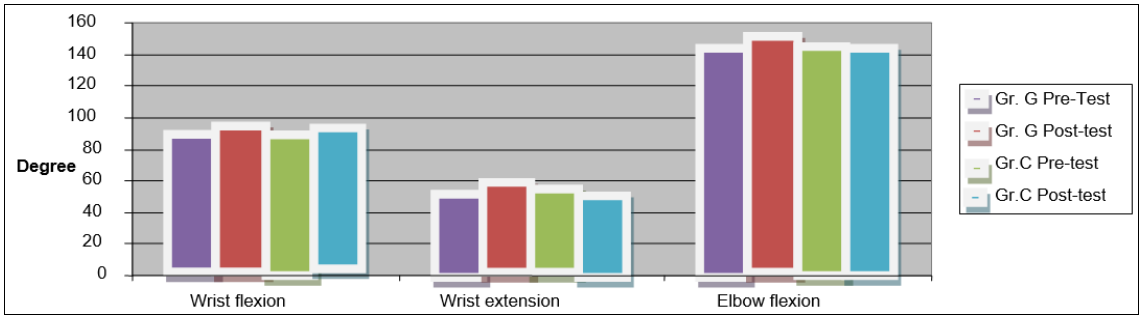

Fig. 1: A comparison of means of pre and post test data on wrist flexion, wrist extension and elbow flexion among Gr. G and Gr. C.

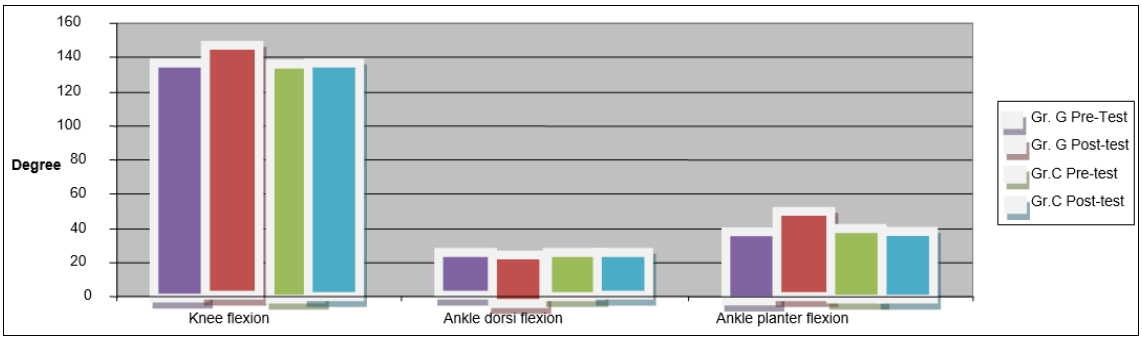

Fig. 2: A comparison of means of pre and post test data on knee flexion, ankle dorsi flexion and ankle planter flexion among Gr. G and Gr. C.

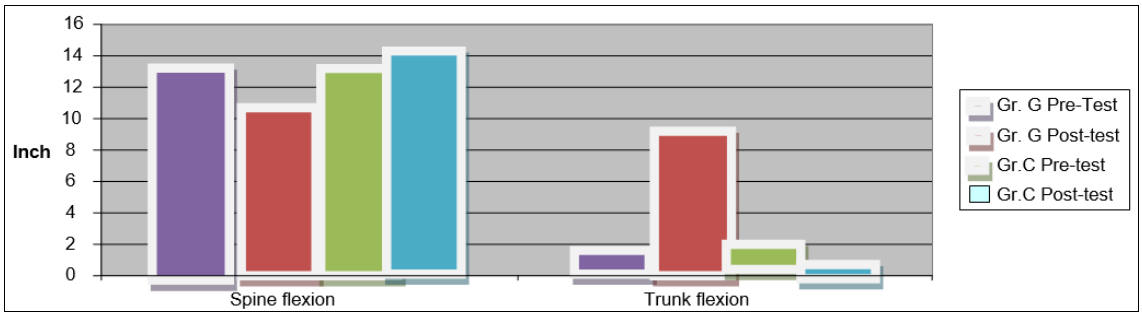

Fig 3: A comparison of means of pre and post test data on spine flexion and trunk flexion among Gr. G and Gr. C.

Flexibility has been considered not only a component of physical fitness but has been considered as a quality of every individual for a better movement, motor coordination and creative-esthetic performance. In this study eight flexibility measures were tested. The result of the present studies showed that gymnastics improved all flexibility measures such as wrist flexion, wrist extension, elbow flexion, knee flexion, ankle dorsi flexion, ankle planter flexion, spine flexion and trunk flexion significantly at .05 level of confidence after six months treatment. These improvements have been presented bar graph (1-3).

In this study gymnastics were used as the way of treatment which involved static stretching, ballistic stretching and dynamic stretching. The result of the present study corroborates with the finding of Locken and Willoughby (1967) [12], Jenson and Fisher (1979) [11], Cureton (1941) [4], Downic (1970) [5], Baley (1977) [2], Ghildial (1980) [6], Bondapadhyay (2012) [3] and partly with the study of Kim & Park (2006) [17], Boraezynski & Urinaz (2009) [16] & Ismile and Sing (2021) [8].

Table 2: Group means increase in Body composition among Gr. G and Gr. C after six months

Variables	Test	Gr. G (N=50)			Gr. C (N=50)		
		Mean	SD	t	Mean	SD	t
Body Mass Index	Pre-test	13.72	2.12	3.13	13.23	1.99	0.017
	Post-test	12.57	2.11		13.02	2.05	
% of Body Fat	Pre-test	12.97	1.89	3.24	12.42	1.66	0.02
	Post-test	11.84	1.86		12.26	1.73	
Lean Body Mass	Pre-test	22.1	1.87	0.35	22.52	1.44	0.074
	Post-test	21.98	2.05		22.25	1.65	

Significant at .05 level of confidence

Table-II represents the mean values of pre and post test for body mass index, % of body fat and lean body mass of both the groups; i.e. Gr. G and Gr. C. The t-values of body mass index, % of body fat and lean body mass of Gr. G were 3.13, 3.24 and 0.35 respectively. The t values of Gr. G in relation to improvement of body mass index (BMI) and % of body fat (%BF) were significant at .05 level of confidence after six months treatment but the t values of lean body mass of Gr. G was not improved significantly. The t-values of body mass index, % of body fat and lean body mass of Gr. C were 0.017, 0.02 and 0.074 respectively. To be significant at .05 level of confidence the t-value should be greater than 2.01. All the t-values of Gr. C were not improved significantly at .05 level of confidence in all body compositions after six months treatment.

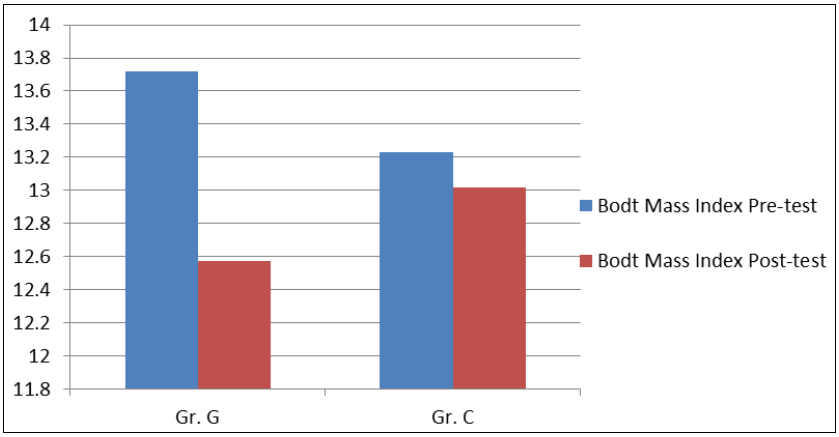

Fig 4: A comparison of means of pre and post test data on body mass index among Gr. G and Gr. C.

In this study, body mass indexes, % of body fat and lean body mass were considered as the component of body composition. Table-2 showed that introduction of gymnastic activities as mean of treatment improved significantly the body mass index scores (Fig. 4). Body mass index is a guide in relation to health of various age group especially pre-school, school children and adolescents. The body mass index for 10-12 years age group should fall off to 12-15. In the present study body mass index scores stand in the same range, so they are not under weight, not over weight but just right. Kim and Park

(2006) [17] observed improvement of body mass index after introducing an exercise programmed among college female students. On the other hand Mukhopadhyay *et al*. (2005) [13] opined improvement of BMI among school students. Bandopadhyay (2012) [3] Found that the improvement of BMI of school boys due to gymnastic activities. The result of the present study has similarity with the above studies but Harris *et al*. (2009) [9] observed no significant improvement in BMI after introducing only school based physical activity.

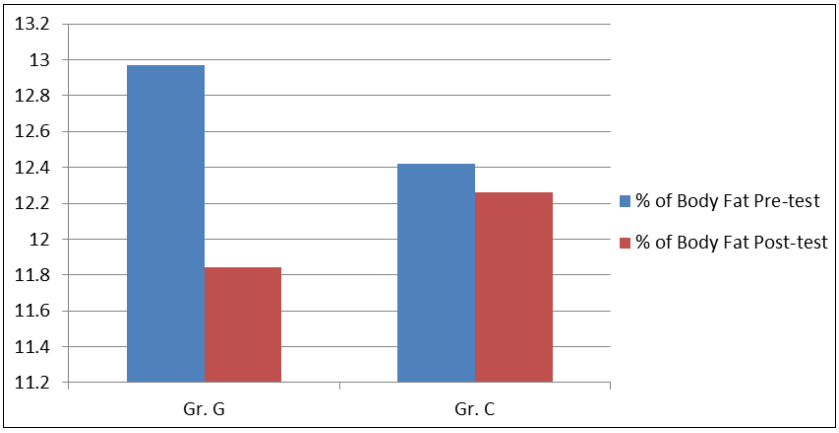

Fig 5: A comparison of means of pre and post test data on % of body fat among Gr. G and Gr. C.

Body fat percentage is the superior gauge of an individual's fitness level, as it is the only body measurement which directly calculates the particular individual's body composition. Actual level of body fat percentage depends upon gender and age. Some body fat percentage levels are related to better health or improved athletic performance. In the present study, Table-2 reflects the result of pre and post test of body fat percentage after six months treatment of gymnastics were significantly improved at .05 level of confidence. These improvements have been presented by bar graph (Fig. 5). Pauscale (1955) found that body fat percentage decreased after introducing a physical training course. On the other hand, Kim and Park (2006) [17] observed the effect of an exercise programme on percentage of body fat among obese female college students and found significant improvement. According to American Council of Exercise the acceptable percentage of body fat for men should be between 18-25%. On the other hand, for girls of 10-12 years age group the healthy range of fat is 12-23%.

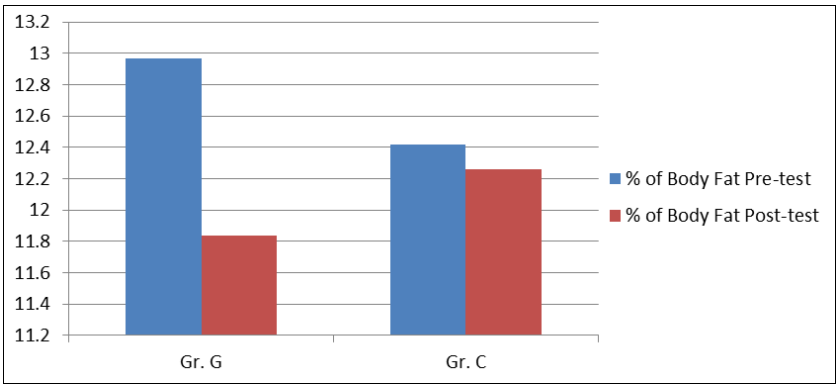

Fig 6: A comparison of means of pre and post test data on lean body mass among Gr. Y, and Gr. C.

Table-2 represents the result of lean body mass among Gr. G and Gr. C. No significant improvement was found among Gr. G and Gr. C at .05 level of confidence after six months treatment. It has been presented by bar graph (Fig.6).
Gymnastics activities not only develop the physical fitness, but also make a sense of fair play and develop individual esthetic values and mental alertness. It also helps to develop mental state.

Conclusion

Under the conditions of the present study the results seem to conclude the following:

1. All flexibility measures such as wrist flexion, wrist extension, elbow flexion, knee flexion, ankle dorsi flexion, ankle planter flexion, spine flexion and trunk flexion were improved significantly due to six months treatment of gymnastic activities.
2. Significant improvement of body mass index and % of body fat were observed by administering six months treatment of gymnastic activities but lean body mass was not improved significantly due to six months treatment of gymnastic activities.

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